

REGION 10 ALGEBRA FORUM MATHINK

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Shifting Our Classroom Instruction
for Math Tasks

Using the Eight Standards for
Mathematical Practices of Common
Core

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Who we are...

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Objectives

- By the end of this session, you will...
 - Gain a deeper understanding of how Mathematical tasks can be utilized for student learning using the Standards for Mathematical Practice.
 - Know how to choose appropriate grade level tasks.
 - Be able to integrate grouping, discourse and questioning strategies for optimal student learning.

Agenda

- Review Standards for Mathematical Practice
- Golden Apples
- Math Tasks and the Common Core
- Questions and Comments

Standards for Mathematical Practice

1. Make sense of complex problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Golden Apples

A prince picked a basketful of golden apples in the enchanted orchard. On his way home, he stopped by a troll who guarded the orchard. The troll demanded payment of one-half of the apples plus two more. The prince gave him the apples and set off again.

A little further on, he was stopped by a second troll guard. This troll demanded payment of one-half of the apples the prince now had, plus two more. The prince paid him and set off again. Just before leaving the enchanted orchard, a third troll stopped him and demanded one-half of his remaining apples plus two more. The prince paid him and sadly went home. He had only two golden apples left. How many apples had he picked?

Horses and Chickens

On a farm there are chickens and horses. There are a total of 18 heads and 48 legs. How many chickens are on the farm?



Strategies...

- Solve a simpler problem
- Draw a picture/diagram
- Use a table a chart
- Look for a pattern
- Work backwards
- Guess and check
- Use algebra
- Look at cases
- Use numerical reasoning
- Use logical reasoning

Mathematical activities are various activities related to mathematics where students engage willingly and purposefully.

- What are the mathematical content goals/objectives?
- What prior knowledge do the students need to have?
- What other mathematics concepts can the task be extended to?
- Does the task require higher level thinking and reasoning?
- Does the task require the use of at least one SMP?
- Is the task based on procedural knowledge and skills?
- Can the task be accessed in various ways by various levels of students?

*“We remember
10% of what we hear,
30% of what we see, and
90% of what we do.”*

—Jean Piaget

Tasks according to Level of Cognitive Demand

- Memorization
- Procedures without Connections
- Procedures with Connections
- Doing Mathematics

*“Selecting and Creating Mathematical Tasks: From Research to Practice.”, -
Beth Herbal-Eisenmann, M. Breyfogle*

Memorization

What is the rule for multiplying fractions?

Expected student response:

You multiply the numerator times the numerator and the denominator times the denominator.

You multiply the two top numbers and then the two bottom numbers.

Procedures without Connections

?

Multiply:

$$\frac{2}{3} \times \frac{3}{4}$$

$$\frac{5}{6} \times \frac{7}{8}$$

$$\frac{4}{9} \times \frac{3}{5}$$

Expected Student Responses

$$\frac{2}{3} \times \frac{3}{4} = \frac{2 \times 3}{3 \times 4} = \frac{6}{12}$$

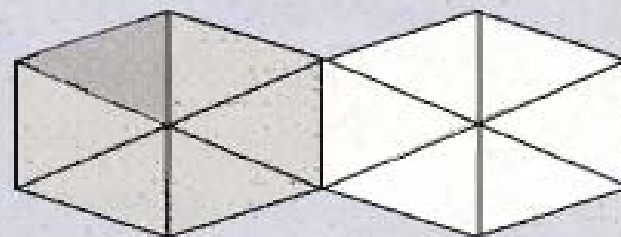
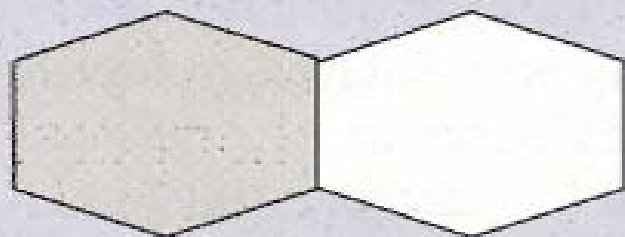
$$\frac{5}{6} \times \frac{7}{8} = \frac{5 \times 7}{6 \times 8} = \frac{35}{48}$$

$$\frac{4}{9} \times \frac{3}{5} = \frac{4 \times 3}{9 \times 5} = \frac{12}{45}$$

Procedures with Connections

Find $\frac{1}{6}$ of $\frac{1}{2}$. Use pattern blocks. Draw your answer and explain your solution.

Expected student response:



First you take half of the whole, which would be one hexagon. Then you take one-sixth of that half. So I divided the hexagon into six pieces, which would be six triangles. I only needed one-sixth, so that would be one triangle. Then I needed to figure out what part of the two hexagons one triangle was, and it was 1 out of 12. So $\frac{1}{6}$ of $\frac{1}{2}$ is $\frac{1}{12}$.

Doing Mathematics

Create a real-world situation for the following problem:

$$\frac{2}{3} \times \frac{3}{4}.$$

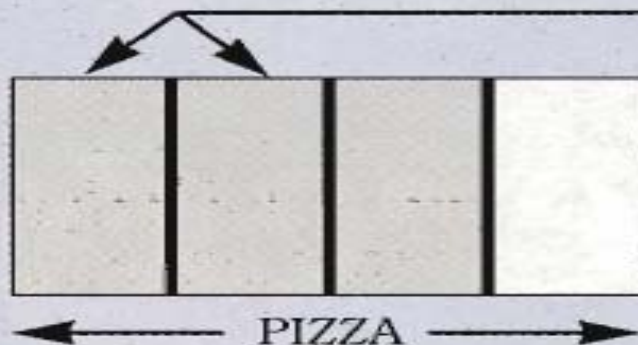
Solve the problem you have created without using the rule, and explain your solution.

One possible student response:

For lunch Mom gave me three-fourths of a pizza that we ordered. I could only finish two-thirds of what she gave me. How much of the whole pizza did I eat?

I drew a rectangle to show the whole pizza. Then I cut it into fourths and shaded three of them to show the part Mom gave me. Since I only ate two-thirds of what she gave me, that would be only two of the shaded sections.

Mom gave me the
part I shaded.



This is what I ate
for lunch. So $\frac{2}{3}$
of $\frac{3}{4}$ is the same
thing as half of
the pizza.

How to Group Students:

- First give students independent think time about the task.
- Then the grouping depends on what outcome you want.
 - Independent
 - Partners, Triads, Small Group
 - Heterogeneous or Homogenous

Whole Group Discussion

- Group sharing
- Class sorting
- Discussion rich in mathematical content
- Discussion rich in academic vocabulary
- Teacher is facilitator
- Students glean insight from other students at all levels

Questioning Strategies

- Focus vs. Funnel
- Who agrees? Who disagrees? Why?
- Does that always work? Can you prove it?
- Do you see a pattern? Explain
- What is alike and what is different in these solution strategies?
- What have we learned before that helped with this task?

Resources

- [Mathematics Questioning Strategies](#)
- [Questioning Our Patterns of Questioning](#)
- Driscoll, M. (1999). *Fostering algebraic thinking: A guide for teachers grades 6–10*. Portsmouth, NH: Heinemann.
- Stein, Mary Kay, and Margaret Schwan Smith. “Mathematical Tasks as a Framework for Reflection: From Research to Practice.” *Mathematics Teaching in the Middle School* 3 Jan. 1998: 268–75.
- Stein, Mary Kay, and Margaret Schwan Smith. “Selecting and Creating Mathematical Tasks: From Research to Practice.” *Mathematics Teaching in the Middle School* 3 Feb. 1998: 344–350.